American Association of Jesuit Scientists

EASTERN STATES DIVISION

PROCEEDINGS

of the

SEVENTH ANNUAL MEETING

WOODSTOCK COLLEGE
WOODSTOCK, MD.
AUGUST 25, 26, 27,
1928

American Association of Jesuit Scientists

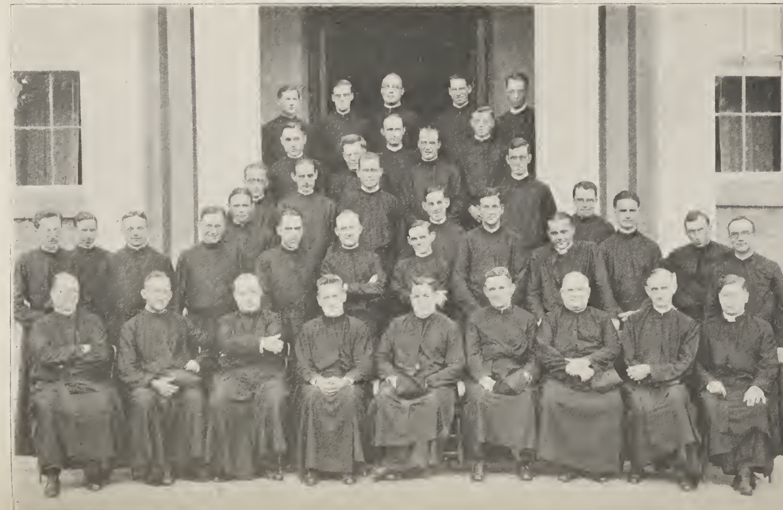
EASTERN STATES DIVISION

PROCEEDINGS

of the

SEVENTH ANNUAL MEETING

WOODSTOCK COLLEGE
WOODSTOCK, MD.
AUGUST 25, 26, 27,
1928



Woodstock Convention, 1928

PROGRAM OF GENERAL MEETINGS.

SATURDAY, AUGUST 25, 10.00 A. M. *Academic Hall*

Address of Welcome - - Rev. Vincent A. McCormick, S. J.

Reading of Minutes. Appointment of Committees.

(In the absence of Rev. E. C. Phillips, S.J.)

Presidential Address - - Rev. Richard B. Schmitt, S. J.

"THE EVOLUTION OF THE ELEMENTS AND THE STABILITY OF COMPLEX ATOMS."

New Business Adjournment.

MONDAY, AUGUST 27, 9.00 A. M. *Academic Hall.*

Election of Officers.

Reports of Secretaries. Reports of Committees.

Discussion. Resolutions.

Adjournment.

PROGRAM OF SECTIONAL MEETINGS.

Biology Section

SATURDAY, AUGUST 25, 3.00 P. M. *Biology Lecture-Room.*

SUNDAY, AUGUST 26, 9.00 A. M. 3.00 P. M.

Chairman's address - - - - Rev. John A. Frisch, S. J.

THE PRESENT STATUS OF BIOLOGY IN OUR COLLEGES.

Our Present Knowledge of Variation and Heredity and Its Relation to the Evolution Question - - - -	CHARLES A. BERGER, S. J.
A Biological Reflection - - - - - -	A. J. MacCORMACK, S.J.
The Study of Biology Not a Mere Handmaid in the Preparation for Medicine	REV. JOHN A. FRISCH, S. J.
Can We Get a New Definition of Speccies from Modern Genetics? - - -	CHARLES A. BERGER, S. J.

PROGRAM OF SECTIONAL MEETINGS.

Chemistry Section

SATURDAY, AUGUST 25, 3.00 P. M. *Chemistry Lecture-Room*

SUNDAY, AUGUST 26, 9.00 A. M.—3.00 P. M.

Chairman's Address - - - - Rev. Richard B. Schmitt, S.J.

QUANTITIVE ANALYSIS OF STEEL.

Philosophy of Chemical Theories - -	REV. T. P. BUTLER, S.J
Preparation of Glyceryl Ester of Lauric Acid - - - - - - - - - - - - - -	REV. H. McCULLOUGH, S.J
Literature Searches in Chemistry - -	FRANCIS W. POWER S.J.
Quantitative Data on Acid Analysis -	REV. G. L. COYLE, S.J.
The Present Status of Valence - - -	REV. J. J. SULLIVAN, S.J.
Mathematical Preparation for the Study of Chemistry - - - - - -	REV. M. J. AHERN, S.J.
Sir Isaac Newton, Chemist - - - -	LAWRENCE C. GORMAN, S.J.
Creative Chemistry - - - - - - - -	REV. G. F. STROHAVER, S.J.
University Research - - - - - - -	REV. J. J. SULLIVAN, S.J.
Hydrogen Ion Determination - - - -	REV. T. J. BROWN, S.J.

Mathematics and Astronomy Section

SATURDAY, AUGUST 25, 5.00 P. M. *Physics Lecture-Room*

SUNDAY, AUGUST 26, 11.00 A. M.

Mathematics Papers to Be Announced at the Meetings.

Simulaneous Records on the Chronograph - - - - - - - - - - - - -	JOHN A. BLATCHFORD, S.J.
Newspaper Astronomy - - - - - -	THOMAS D. BARRY, S.J.

PROGRAM OF SECTIONAL MEETINGS.

Physics Section

SATURDAY, AUGUST 25, 3.00 P. M. *Physics Lecture-Room.*

SUNDAY, AUGUST 26, 9.00 A. M. – 3.00 P.M.

Chairman's Address - - - - - Rev. John A. Tobin, S.J.

PHYSICAL LAWS AND CONSTANTS.

The Electromagnetic Spectrum

Introduction. The Complete Electromagnetic Spectrum - - - - - -	REV J. A. TOBIN, S.J.
Electro Magnetic Waves and Three Electrical Circuits - - - - - - -	EDMUND J. NUTTALL, S.J.
Short Radio Waves - - - - - - -	REV. W. R. CRAWFORD, S.J.
Nature of Light Waves. Polarized Light	JOSEPH R. HEARN, S.J.
X-Ray Spectra and Atomic Structure -	THOMAS H. QUIGLEY, S.J.
Gamma Rays - - - - - - - - -	LEO F. FEY, S.J.
Cosmic Rays - - - - - - - - - -	REV. H. M. BROCK, S.J.
Stethophone - - - - -	REV. T. J. LOVE, S.J.

Geo-Physics

The Attack on the Problem of the Earth's Age - - - - - - - - -	REV. F. A. TONDORF, S.J.
The Value of the Estimates of Geological Time - - - - - - - -	REV. M. J. AHERN, S.J.
The New Seismic Station at Fordham University - - - - - - - - - -	JOHN W. TYNAN, S.J.

PROCEEDINGS.

The seventh annual meeting of the American Association of Jesuit Scientists (Eastern States Division) was held at Woodstock College, Woodstock, Maryland, on August 25-27, 1928. The first general meeting was held on August 25, at 10 A. M., in the Auditorium. In the absence of Rev. Edward C. Phillips, the President of the Association, the chair was occupied by Rev. Richard B. Schmitt. The Rev. Vincent A. McCormick, S.J., Rector of Woodstock College, delivered the address of welcome, in which he stressed the interest of Very Rev. Fr. General in the work of the Association and informed the members that Father General had sent his blessing. The minutes of the last meeting were read by the Secretary and accepted as read. The Chairman named the following committees:—

Committee on Nominations:—
Fr. Logue, *Chairman*
Fr. Sullivan
Fr. Frisch

Committee on Resolutions:—
Fr. Shaffrey, *Chairman*
Fr. Hohman
Fr. Dore

The Chairman appointed the Rev. John P. Delaney to act as Chairman of the Mathematics Section in the absence of Father Phillips.

Then followed

PRESIDENTIAL ADDRESS.

The Evolution of the Elements and the Stability of Complex Atoms.

Rev. Richard B. Schmitt, S.J.

The problem of evolution is one of vast importance to those engaged in scientific pursuits. Biological or Organic Evolution has played a leading role with scientists and philosophers for more than half a century:—and now the problem is again presented, but in another form—even more fundamental than Organic Evolution,—and so deserves our interest and attention, that is: the evolution of the elements.

In present-day scientific literature we read: that the elements are

very probably intra-atomic compounds of hydrogen and that one of the first steps in the formation of a complex atom is the change of hydrogen to helium. — To substantiate this theory we had recently several classical experiments. — In 1925, the scientific world was startled by announcements coming out of Berlin and Tokio that in each capital mercury had been successfully changed into gold. The real dream of the alchemist had at last been accomplished. Still, it was asserted that the thing had been done. Dr. Adolph Miethe of Germany and Dr. H. Nagaoka of Japan were the respective claimants to this unique distinction. Each was perfectly honest, but of course, we know that other workers have not been able to substantiate their claims. However, despite the exceeding care with which the mercury was purified in advance, the traces of gold obtained must be ascribed to the presence of impurity. Still, let us have a look at the method employed and the principle involved, for they are of great theoretical interest and may become of practical importance.

The method in each case consisted in passing an electric discharge through mercury vapor. This means that these would-be alchemists shot into the mercury vapor high-speed electrons. Their hope was to cause an occasional electron to penetrate the nucleus of a mercury atom and stay there. Let us see what this would do. The atomic number of mercury is 80 and that of gold 79. That is, the nucleus of a mercury atom possesses 80 positive charges and that of an atom of gold 79 charges. Suppose one negative electron should be lodged safely within the nuclear fold of the mercury atom and find there a haven of rest. This electron would, of course, neutralize one positive charge and thereby reduce the atomic number from 80 to 79, that of gold. In fact, a mercury atom would have been transformed into an atom of gold. This neutralization of one positive charge would doubtless mean the obliteration of a nuclear proton with the liberation of a certain amount of energy.

Then, in the autumn of 1926, the report came from Germany that Professor Paneth and Dr. Peters, of the University of Berlin, had succeeded in transmuting hydrogen into helium. To bring about this supposed transformation, these German Chemists made use of palladium, a heavy rare metal, which in the spongy state has the property of absorbing a thousand times its own volume of hydrogen gas. Not only does it absorb the gas but it also changes it from the molecular state to the atomic, a condition in which hydrogen is much more active. For instance, if a little of this spongy palladium is dropped into a flask of hydrogen and oxygen, so active does the hydrogen become that the two gases unite with explosive violence. For twelve hours a stream of hydrogen was passed over palladium in finely divided state. Then, with the spectroscope they were able to detect in the hydrogen the principle lines of the helium spectrum. The quantity of

helium thought to have been formed was exceeding small, estimated to be only a few thousand millionths of a cubic centimeter. Consequently, it was impossible to know whether the theoretical destruction of mass with the resulting production of energy had been accomplished or not. It was thought that this energy might have passed off in the form of the exceedingly penetrating cosmic rays. Repeated experiments have failed to confirm this transformation.

Dr. William D. Harkins, of the University of Chicago, is of the opinion that all the elements are very probably intra-atomic compounds of hydrogen and proves his theory by giving us a new Periodic System which shows a relation between the abundance of the elements and the structure of the nuclei of atoms. He further states, that evidence has been presented for the theory, that the variation in the chemical, and in such physical properties of the elements as cohesion, atomic volume, compressibility, co-efficient of expansion, melting point, etc., depends first of all upon the arrangement in space of the negative electrons in the atom external to the nucleus, and also upon the number of such electrons. The number of the electrons presumably depends upon the nuclear charge. The structure of the nucleus determines what is called the stability of the atom, since it is not considered that the atom breaks up unless the nucleus disintegrates. For example, when negative electrons are given off under the influence of light, or from some similar cause, the atom is said not to decompose, but only to become electrically charged. Then too, the 91 elements other than hydrogen, of our ordinary system, fall into two series. At least among the elements of lower atomic weight, the atoms which have "even atomic numbers are in general built up from helium atoms, and therefore may be said to have the general formula: n He' where the prime is added to indicate that these elements are intra-atomic, not chemical compounds. The "odd" numbered elements, beginning with lithium, seem in general to have the formula n He' + H3.' Thus these elements fall into two series which may be distinguished as "even" or "odd."

We find here several statements which are vague and to say the least—extreme. To say: that the elements which have even atomic numbers, at least those with low atomic weights, are in general built up from helium atoms,—evidently calls for further proof. Furthermore, the general formulae which are given, and when applied to the various elements of the periodic chart, are only correct when certain whole numbers are prefixed, for which the author gives no apparent reason.

The Hydrogen-Helium System and the Abundance of the Elements.

Dr. Harkins claims that the composition of the nucleus should affect its own stability, which from radioactive evidence means the stability of the atom, and from this standpoint it might be reasonable to suppose

that the atoms of one of the series, the even or the odd, should be more stable than those of the other. Now unfortunately, there is no known method of testing the stability of the lighter atoms, but it might seem, at least at first sight, that the more stable atoms should be more abundantly formed, and to a certain extent this is undoubtedly true.

In studying the relative abundance of the elements the ideal method would be to sample one or more solar systems at the desired stage of evolution, and to make a quantitative analysis for all of the 92 elements of the ordinary system. Since this is impossible, even in the case of the earth, it might be considered that sufficiently good data could be obtained from the earth's crust, or the lithosphere.

However, there are several important factors which cause our knowledge of the quantitative composition of the earth's crust to be of much less value for the solution of our problem than it might seem to possess on first thought. In the first place the quantitative analyses which have been made represent the composition of only the mere skin of the earth, the depth of which does not exceed the ten or twenty miles caused by geologic displacements. The surface of the earth has been markedly influenced both by igneous processes which have resulted in magmatic differentiation, and by weathering, solution and redeposition. For example, the common idea that sodium is a very abundant element undoubtedly has its origin in the fact that the solubility of its salts has caused their very considerable concentration in the oceans. Again, the fact that the salts of sodium are much more fusible than similar salts of the alkaline earths and most other salts in the rocks, has probably caused it to be segregated by magmatic solution and redeposition. Thus, while the average igneous rock found on the surface of the earth there seem to be about 2.23% of sodium, it is not improbable that this is a larger percentage than would be found if the whole material of the earth could be taken as a sample of analysis.

If the sun is next considered it is found that although a large mount of its surface is exposed to us for spectroscopic investigation, the spectroscope gives no accurate measure of the quantitative composition, and that its findings are largely influenced by the height in the gaseous envelope of the sun at which the observation is taken.

The Composition of Meterorites as Related to the Structure of Complex Atoms.

There is material available of which accurate quantit tive analysis can be made, and which falls upon the surface of the earth .

The bodies which fall are called meteorites, and no matter what theory of their origin is adopted, it is evident that this material comes from more varied sources than the rocks on the surface of the earth. In any event, it seems probable that the meteorites represent more ac-

curately the average composition of material at the stage of evolution corresponding to the earth than does the very limited part of the earth's material to which we have access. At least it might seem proper to assume that the meteorites would not exhibit any special fondness for the even-numbered elements in comparison with the odd, or vice versa, any more than the earth or the sun as a whole, at least not unless there is an important difference between these two systems of elements.

A preliminary study of the most recent analysis of meteorites of different classes showed that, either for any one class or for the meteorites as a whole, the even-numbered or helium system elements are very much more abundant than those of the odd-numbered or helium hydrogen system. For a more detailed study use was made of the older but much more complete and more valuable data collected by Farrington, who suggests that the average composition of meteorites may represent the composition of the earth as a whole.

The result obtained by averaging the analysis of 318 iron and 125 stone meteorites, 443 in all, show that the first seven elements in order of abundance are: Oxygen, iron, nickel, silicon, magnesium, sulphur and calcium; and not only do all these elements have even atomic numbers, but in addition they make up 98.6% of the material of the meteorites.

Of the remaining elements present to a great enough extent to have an appreciable effect upon the percentage values, 7 are odd and 5 are even, but in all only 1.2% are odd numbered, while 98.78% are even.

Composition of the Crust of the Earth.

It has already been pointed out that the earth's surface cannot be expected to give such good evidence as the meteorites on account of its much more local character. If, in this connection, Clarke's latest average for the composition of the lithosphere is used, it is found that of the five most abundant elements, four have even atomic numbers, while of the first nine, six are even-numbered, as follows:

8	Oxygen	47.33	
14	Silicon	27.74	
13	Aluminum		7.85
26	Iron	4.50	
20	Calcium	3.47	
11	Sodium		2.46
19	Potassium		2.46
12	Magnesium	2.24	
22	Titanium	0.46	
		85.74	12.77

The six even-numbered elements will be seen to make up 85.74% of the lithosphere, while the three odd-numbered elements amount to 12.77%.

If the lithosphere, hydrosphere and atmosphere are included and all the elements are taken into account, then it is found that the odd-numbered elements is only 12.49%, or the even-numbered elements are about seven times more abundant. In this connection hydrogen is omitted for consideration, since it does not belong to the helium system of elements under discussion. But, when we are formulating a general theory about all the elements—hydrogen should be included, and so this seems to be a serious defect in the system.

Since the surface of the earth has been subjected to far-reaching differentiative processes, it would be valuable if evidence could be obtained in regard to elements which have not been thus effected.

The Abundance of the Elements is Related to the Atomic Number and not to the Ordinary Periodic System.

It has been stated that there seems to be no real connection between the abundance of the elements and the periodic system of Mendeleeff, and this is true when the subject is considered from a broad standpoint, that is without emphasizing unduly the importance of the quantitative composition of the earth's Surface as a measure of the relative abundance at the stage of atomic evolution represented by the solar system. There is an apparent relation when we consider that the maximum for abundance occurs between the elements with atomic numbers, 8 to 28, therefore in Series 2, 3 or 4 of the ordinary periodic system. Now since our knowledge of the elements from the systematic standpoint, is all tied up with this system, it will be of use to also compare the relative abundance of the elements on the same basis, for even although the fundamental relation is not expressed at all by the form which the system takes, the variable which conditions both the periodic table and the abundance of the elements is the same, that is, the atomic number. When the attempt is made to show the relative abundance in each group in the periodic system by the use of the data in regard to what we have considered the most representative material whose composition is known to us, that is, the meteorites, it is found that the percentages, the elements of atomic numbers higher than that of copper (29), are so small as not to be represented. The same condition might be found with reference to analysis of the crust of the earth, if it were not that by differentiation, and by the formation of veins and other means, the percentage amount of any individual element is often erroneously increased, so that the elements which are comparatively rare from the general standpoint may become very abundant in certain localized deposits, as for example, the

copper in the Lake Superior region. Now, it is evident, since none has any accurate knowledge of the fraction of even the earth's surface which is made up of such deposits, that any estimate of the relative abundance of an element present in a small percentage amount in the earth's crust will not have any claim to accuracy.

Has this data sufficient value to authorize Dr. Harkins to come to the conclusion: that, therefore all the elements are very probably intra-atomic compounds of hydrogen? We do not think that there is sufficient evidence in his theory to substantiate the claims which he makes in his conclusion, and our reasons are as follows:

1. The formula n He' when applied to the series of elements of "even" atomic numbers beginning with helium, and the formula, n-He' + H3' when applied to the series of elements of "odd" atomic numbers —are only correct when prefixed by the proper whole number, for which there is no apparent reason.

2. In the average composition of iron and stone meteorites, in order to show that the even-numbered elements are in every case more abundant than the odd-numbered elements—the helium or zero group is entirely omitted, which certainly should be included.

3. In calculating the average composition of the lithosphere, hydrosphere and atmosphere—hydrogen is omitted from this consideration.

4. Although the most abundant elements have been found to be those of atomic number less than 30—we know that beryllium and lithium are comparatively rare.

5. In proving that there is a great similarity in the composition of the earth's crust and the meteorites, as regards the even and odd system, we note: that the alkali metals sodium and potassium, the halogens and aluminium are very much more abundant in the crust of the earth. Furthermore, in the meteorites calcium is much less abundant than magnesium, whether calculated by weight or as atomic percentage, while in the lithosphere calcium is more abundant by weight but less plentiful from the standpoint of the number of atoms.

6. As regards the stability of the complex atoms, there is another factor to be considered, the supply of material available under certain conditions and in a form suitable for the formation of the nucleus.

So we find that materialists are still apt to come to conclusions, which conclusions are not substantiated by sufficient data. We certainly are advocates of the greatest scientific progress, and as scientists (and also from the standpoint of philosophy) are very much interested in the problem of the ultimate constitution of matter, but we must examine the problem of the evolution of the elements with the proper perspective and for what it is really worth in fact. We are not critical, but we request that a hypothesis should not be proferred as a theory, nor a theory as a fact until we have sufficient evidence.

The Chairman read letters from Very Rev. Fr. Provincial and from Father Phillips wishing success to the meeting.

In the afternoon and on Sunday, August 26, the various sections held their separate meetings.

On Monday, August 27, at 9 A. M. the final general session was held in the Auditorium. The report of the Committee on Nominations was called for. Father Logue announced that the committee had decided to place in nomination the names of Fathers Phillips and Schmitt for the office of President and Messers. Gorman and Power for the office of Secretary. Fr. Phillips was reelected President and Mr. Gorman was elected Secretary. In the absence of Father Phillips, Father Schmitt continued to occupy the chair.

Fr. Brock was reelected Editor of the Bulletin.

The reports of the Secretaries of the different sections showed that the following officers had been elected for the coming year:

Biology:	Chairman, Rev. John A. Frisch.
	Secretary, Mr. Charles Berger.
Chemistry:	Chairman, Rev. Richard B. Schmitt.
	Secretary, Mr. Lawrence C. Gorman.
Mathematics:	Chairman, Rev. Edward C. Phillips.
	Secretary, Mr. Thomas D. Barry.
Physics:	Chairman, Rev. William G. Logue.
	Secretary, Mr. Joseph R. Hearn.

Next followed the Report of the Committee on Resolutions. Fr. Shaffrey read the following Resolutions, which were accepted as read:

The Committee on Resolutions wishes to the Association in general session the following recommendations.

First. Be it hereby resolved,

That the President of the Association convey to the Rev. Rector of Woodstock College, to Rev. Fr. Minister, and to their obliging corps of assistants, an expression of gratitude of the members for the extremely kind welcome extended to them during this, the Seventh Annual Meeting of the Association, and also their special feeling of gratitude for the greetings of His Paternity.

Second. And be it further resolved,

That the sincere gratitude of the entire Association be extended to Father Brock for his efficient and untiring labors for the past success of the Bulletin and to Mr. Thomas Quigley, of Holy Cross College, for the skillful production of the various of the Association Bulletin.

The Acting President Fr. Schmitt had prepared a mimeographed List of Topics to be discussed at the final General Session. These Topics were now discussed.

1) Should membership be limited strictly to those engaged in scientific work? Fr. Logue proposed a motion that membership should not be so limited. This motion was seconded by Fr Joseph Sullivan, and carried.

2) Should we have a revision of the membership each year? Fr Logue proposed that we should not have such a revision. This motion was seconded by Fr. Jos. Sullivan and carried

Fr. Frisch proposed that a card be sent to every member of the Association and asking the member whether he wishes to continue his membership or not. If no reply is received to the first card, a second is to be sent. If no reply is received to the second card, the member is to be dropped. (This motion was made with the provision, that if it contains anything contrary to the constitutions it is to be withdrawn.) As such it was seconded and carried.

3) Should Lay Professors be allowed to attend the Annual Meetings? Fr. Frisch proposed that they should not be allowed to attend. His motion was seconded by Fr. Jos. Sullivan and carried.

Fr. Ahern proposed that Fr. Frisch be authorized to make an investigation regarding the possibility of the Lay Professors forming a Science Association as a subsidiary of the Jesuit Science Association. This motion was seconded by Fr. McCullough and carried.

4) Should the Bulletin be printed? Fr. Frisch proposed that it should be printed. Seconded by by Fr. Ahern and carried. Mr. Roth proposed that the number of issues of the Bulletin be left to the discretion of the Rev. Editor of the Bulletin, Fr. Brock, but that the first issue should consist of the annual proceedings. Seconded by Fr. Jos. Sullivan and carried. Fr. Ahern proposed that the Constitutions of the Association be reprinted in the Annual Proceedings of this Convention, so that all the members might have a copy of said Constitutions. Fr. Frisch proposed that the Secretaries of the different sections request articles for the Bulletin by postal on the first day of each month from October to May. Seconded by Fr. Jos. Sullivan and carried.

Fr. Logue proposed that the expense of these postals should be charged to the General Expense account of the Association. Seconded by Fr. McCullough and carried

5) Should there be a Program Committee for the Annual Meeting? Fr. Ahern proposed that there should be such a Program Committee and that it should consist of the Chairman of the Chemistry Program Committee, and the Chairman of the other different sections. Seconded by Fr. Crawford and carried.

6) Should Geology papers be sub-joined to the Physics section, and Astronomy papers to the Mathematics Section? Fr. Merritt proposed that these papers should be so subjoined. The motion was seconded and carried.

Fr McCullough made a motion to adjourn. The motion was seconded and carried.

At a meeting of the Executive Committee, the following members were admitted to the Association:-

Coniff, Authur A.
Cusick, William H.
McGowan, George P.
Murray, Joseph L.
Sheehan, William D.

The following members of the Association were present at the meeting:

Ahern, Rev. Michael J.
Barry, Thomas D.
Berger, Charles A.
Berry, Rev. Edward B.
Blatchford, John A.
Bouwhuis, Rev. Andrew L.
Brown, Rev. T. Joseph
Butler, Rev. Thomas P.
Coniff, Authur A.
Crawford, Rev. William R.
Delaney, Rev. John P.
Dore, Rev. Francis J.
Fey, Leo F.
Freatman, Harold L.
Frisch, Rev. John A.
Gisel, Eugene A.
Gorman, Lawrence C.
Harley, James L.
Hearn, Joseph R.
Hohman, Rev. Authur J.
Kirchgessner, George J.
Logue, Rev. William G.
Long, John J.
Love, Rev. Thomas J.
McCauley, Rev. David V.
MacCormack, Anthony J.
McGowan, George P.
Merrick, Rev. Joseph P.
Nuttall, Edmund J.
Power, Francis W.
Reardon, Francis X.
Roth, Albert C.
Roth, Charles A.
Schmitt, Rev. Richard B.
Schraffrey, Rev. Clarence E.
Smith, Rev. John P.
Sullivan, Rev. Joseph J.
Tobin, Rev. John A.
Wolff, Edmund J.
Bihler, Hugh J.
McCullough, Rev. Henry B.

ABSTRACTS

BIOLOGY

Chairman's Address

The Present Status of Biology in Our Colleges.

(Abstract)

Biology in our colleges has advanced, within the last ten years, from a one year course of four semester hours, to a two year course of eight semester hours each. The new B.S. schedule, recently introduced, necessitates at least three years of biology, and makes possible four courses of eight semester hours each.

To keep pace with this development we have extended, shifted and rearranged our courses. But there has been no uniformity and very little system in our attempts to meet the demand for more biology. The results are a variety of courses and a still greater variety of equipment.

The present paper proposed a uniform course in our colleges and a standardization of equipment. A series of papers discussing the various phases of this standardization was proposed and individual members of this section volunteered to prepare these for publication in the bulletin, and subsequent discussion at next year's meeting. John A. Frisch, S. J.

Our Present Knowledge of Heredity and Its Relation to Evolution.

(Abstract)

This paper was a summary of the developement of the science of heredity from the time of Mendel to the present. It treated first of the bearing of genetics on evolution and then briefly took up several fundamental topics necessary for a proper understanding of the question such as the cell doctrine, cell division and the mechanics of the maturation of germ cells. The experimental method of attacking the problem of heredity was exemplified by Mendel's simple experiments and the cytological approach to the question was then viewed. Linkage, determination of sex, sex linkage, duplication and non-disjunction of chromosomes, the phenomenon of crossing-over etc., were then passed in review. The relation of these findings of heredity to the evolution question was then treated. With the rejection of the inheritance of acquired characteristics it would seem that the only way in which evolution could have taken place, if it has ever occured, is by direct modification of the germ plasm, until recently there has been little or no evidence of such modifications. Recently however investigators claim that by the agency of radium, X-rays, and ultra violet light, real mutations of the chromosomes have been brought about. These cases merit our attention and critical study.

Charles A. Berger, S. J.

The Study of Biology Not a Mere Handmaid In The Preparation For Medicine.

(Abstract)

Biology has become a subject of great prominence even in our everyday literature. And therein lies a danger. Modern psychology is using biology to deny man's free soul, and to make him an irresponsible victim of his glands. Mechanistic evolution, eugenics, birth-control, heredity of criminality are becoming topics of common conversation and they are hurting the faith of many and the morals of more.

It is vitally necessary then, that at least our college graduates be able to sift the truth from the chaff of unproved assumptions and gross exaggeration, and this they will not be able to do convincingly to themselves and others without a clear knowledge of the principles and theories of biology. Besides, in our hands, biology can be used to confirm our faith and protect and improve our morals in many ways.

A one year course in biology, consisting of lectures only was proposed as of obligation for all our students in the A. B. course.

John A. Frisch, S. J.

CHEMISTRY

CHAIRMAN'S ADDRESS

Rev. R. B. Schmitt, S.J.

Quantitative Analysis of Steel.

(Abstract)

This type of analysis might be introduced in our regular college courses of Quantitative Analysis.

1. Total Carbon Determination in Steel and Iron.
   Direct combustion method of Fleming, Andrews Steel Corporation.
   Cf Diagram of Apparatus.

Suggestions for successful operaton of analysis:

1. Use a Hoke-Phoenix reducing valve on oxygen tank.
2. Use a C. W. S. flow meter or Mercury pressure gauge.
3. Use a Johnson's clay or porcelain combustion tube instead of silica tube of Fleming.
4. Granular zinc, mesh 30, and phosphorus pentoxide may be placed in the same tower.
5. Interpose a drying tube with phosphorus pentoxide between Fleming absorption tube and potash cylinder.
6. Oxygen flow should be 300 cc per min. Take a 300 cc bottle and collect by displacement at the end of train.
7. Temperature of combustion furnace 1050°—1100° C. Calibrate with pyrometer and make a chart of readings.

8. Use nickel boat with RR Norton alundum, 90 mesh—instead of alundum boat of Fleming.
9. Student samples from Dr. G. E. Lundell, Bureau of Standards, Washington, D. C.
   Pure Ingot Iron from Dr R. F. Passano, American Rolling Mill Co., Middletown, Ohio.
10. Insert the sample into the combustion tube as quickly as possible.
11. Make the run-time 10 mins. instead of five mins.
12. After getting a constant blank, make three determinations that agree closely. (Have two absorption tubes). The allowable error is 0.02% in steel containing 1% carbon.

Searching the Chemical Literature.

(Abstract)

This paper embodies some of the experience gained by the author in conducting several rather extensive literature searches along the line of Organic Chemistry; the whole subject however has been treated in an exhaustive and eminently satisfactory manner by E. J. Crane and A. M. Patterson in their excellent book, "The Literature of Chemistry" (Wiley, 1927).

On many counts the knowledge of the "technique" of conducting a literatuure search is *useful* for professors of General Chemistry, Organic Chemistry, Analytical Chemistry, and especially Physical anl Physiological Chemistry; but it is *indispensable* for a chemist doing research work ex professo in order to avoid duplicating the results of others. Before doing any laboratory work on a research problem, he must have previously so delimited it by an exhaustive literature search that he will know with absolute certainty under what precise formality he must attack the problem experimentally.

The language question is a real difficulty and must be met squarely. Although about 50% of the world's chemical literature is written in English, the rest will remain inaccessible to the chemist unless he can read with facility scientific articles in French and German, and there is no way out except to master these languages (to that extent at least) at all costs. If one can read with reasonable facility ordinary French and German, the scientific articles commonly met with in these languages can be covered with an accuracy suitable for all practical purposes, and the peculiarities of nomenclature, etc., can be picked up quite easily from any one of the several books on scientific French and German. A good reading knowledge of English, German, and French puts at one's disposal about 93% of the current chemical literature of the world. Furthermore, if one can read German well he can also make sufficient headway with Dutch, in which about 2% of the litera-

ture appears; but the Italian and Russian usually require a translator. For the former a knowledge of Latin is by no means as helpful as is ordinarily believed. A knowledge of Spanish is of no great practical importance.

The actual library procedure for an exhaustive literature search begins of course by covering thoroughly the ordinary texts and chemical dictionaries, especially (for Organic) Meyer and Jacobsen, Beilstein, and Richter's Lexicon der Kohlenstoffverbindungen; using the new Beilstein and its Ergaenzungsbaende the literature can be brought up almost to date, although Richter alone carries it to the end of 1909. To go more into detail in the older literature and to bring the search up to date, the decennial General-Registern of the Chemisches Centralblatt should next be gone through, thus bringing the bibliography up to the end of 1921; and from this point on the annual indexes of our own Chemical Abstracts can be used. The subject should be sought under every possible heading in all these indexes. When the second decennial index of Chemical Abstracts is available, it will be entirely adequate for all the literature of 1927-1926 inclusive. Before 1917 it is well to rely on the Centralblatt. With these sources as a basis, the search can quite easily be made exhaustive by means of footnote references in the articles already covered; and the end of the search is in sight when the same articles keep recurring again and again. The important articles should be taken down almost entirely—the others abstracted at more or less length depending on their importance. At the end of the search the investigator should know just what precise bit of information is necessary to make his proposed experimental investigation a *new* contribution to scientific knowledge.

New York and Washington are the two great library centers of the eastern United States. In the former are the Public Library, the libraries of the Chemists' Club, the Academy of Medicine (now at 5th Ave. and 105th St.) and the Engineering Societies. In Washington are the Congressional Library, the Army Medical Library, and the libraries of the Ordnance Department and the Department of Agriculture. Boston and Baltimore also afford very good library facilities.

FRANCIS W. POWER, S. J.

Valence.

Two factors determine the combining power of one element with another: an intensity factor, which we call Chemical Affinity, and which is measured by the Free Energy of the compound formed, and a capacity factor, which we call Valence, and which is the measure of the number of chemical equivalents of other elements with which it can combine.

The Valence (or Valences) of an element depends on its position in the periodic table. The mechanism of valence depends on the type of compound formed. If this is a polar compound, then there is a transference of electrons: if non-polar, there is a distribution of the electrons about a mean position of the nuclei. Characteristic (or frequently occurring) valences are occasioned by the tendency of certain electron configuration to be more stable than others—most stable configuration being those of the rare gases. Thus Chlorine has a negative valence of 1, here taking on the Argon configuration. Chlorine also shows a positive valence of 7, when it reduces to the Neon configuration.

A Chart was exhibited, with Valence plotted against Atomic Number to exemplify the above.

JOSEPH J. SULLIVAN, S. J.

Sir Isaac Newton, Chemist.

An examination of original sources of information proves that Newton experimented in Chemistry in his own laboratory near the gates of Trinity College at Cambridge for a period of thirty-five years. His conclusions concerning the constitution and behavior of matter were shown to be close approximations to our present day scientific conceptions of these subjects.

Newton's ideas on the constitution of matter were defended and spread abroad by Fr. Boscovich, S. J. and in all probability thus came to the attention of John Dalton, and furnished him with the essentials of his Atomic Theory.

LAWRENCE C. GORMAN, S. J.

University Research In Chemistry.

The aim of the Graduate School is to develop originality and self-reliance—an attitude which challenges anything new, or anything old, which does not agree with one's findings. One Professor said that he doubted everything he did not understand. The spirit of self-reliance is developed in lecture-room and laboratory: in lecture-room, by subjecting every topic and name (though hallowed) to a rigid scrutiny: in the laboratory, by assigning unfamiliar problems to the student, who is constantly forced to consult the known sources along with his own originality.

The preliminary lecture and laboratory work finished, the student is supposed to be equipped with sufficient theoretical information and technichal skill to take up an original problem in research. A brief discussion of the solution of one of these problems was given.

JOSEPH J. SULLIVAN, S. J.

PHYSICS

Chairman's Address

Physical Laws and Constants.

Rev. John A Tobin, S. J.

The purpose of the paper was to explain a method of teaching Physics in the Arts course. At the beginning of the year the helplessness of the student in the laboratory, and his blank face in the lecture room give the proof that he has no appreciation of the scientific method, and very little sympathy for the patient toil of the great Physicists who have revealed the secrets of nature.

The scientific method consists of observation, experiment, and calculation. This was explained from the simple relation of the circumference and the radius. First there is the observation that the circumference varies as he radius. Secondly there is the experiment of measuring accurately many circles, and the determination of the circumference and the radius is always a constant we call 2π. Thirdly there is the calculation of any circumference if we know the constant and the radius. And all through the Physics course we follow these three steps. Many examples were given from the year's work in Physics and it was found a great help in coordinating the lecture and laboratory work. For example Hookes Law was shown in the lecture room, and in the laboratory the students observed for themselves that stress varies as the strain. Then the experiment that the stress divided by the strain gives a constant. Then the problems finding a stress when the constant and strain is known. After going through the Physics course in this way the student has some appreciation of the method of observation and the meaning of Physical laws. He realizes from his own experience the work required to determine a constant and from many problems he trains his mind to reason logically. Instead of memorizing a problem, he used the mathematical formula of the law as a major of a syllogism, the problem as the minor and his answer as the conclusion.

In this way the student also finds the meaning of Physical laws in the Physics class, and is not confused from the definition given in Philosophy. As he is only studying proximate causes, he sees that the Physical laws are a resume of observations in the experimental order, and are limited by the experiments. He sees that exceptions to laws come from a false statement of the law either from exterpolation as in Boyle's Law, when the experiment did not justify it for high pressures, or from inductions that have gone beyond the limits justified by the experiments.

When the student grasps the meaning of the Physical law, and experiments himself in determining the constant, he knows how far he is justified in his calculations, and can judge the conclusions of the so called scientists of the day, who are most unscientific, when they draw conclusions about the supernatural.

γ-Rays and Radioactivity.

LEO F. FEY, S. J.

After defining a radioactive substance as one which disintegrates spontaneously, a few words were given on the nature of radioactivity and radioactive substances in general. It was stated that radioactive substances emit three rays, α- β- and γ-rays, skipping over the peculiar characteristics of the α-β-rays, a more detailed account of the γ-radiation was given.

The γ-rays were studied by evolving the nature of the γ-rays as shown in their wavelength, the absorption of the γ-rays, the ionization produced by γ-rays and the scattering of the γ-rays. This plan of study was chosen because the same plan could be used in studying the α- and β-rays.

The article was concluded by summing up briefly the different findings. A radioactive substance is one that disintegrates spontaneously and in so doing emits three rays. The γ-rays of this radioation have very small wavelengths, are absorbed very slightly, do not ionize directly and are not affected by scattering.

The Complete Electromagnetic Spectrum.

REV. JOHN A. TOBIN, S. J.

One of the greatest glories of the 19th century was the discovery that light was an electromagnetic pheonomenon. And the credit for this discovery belongs to Michael Faraday and James Maxwell. Faraday who was an experimental genius, but destitute of mathematical training expressed his results in terms of lines of force and poles. Maxwell in translating these conceptions into mathematical form came to the conclusion that if such a medium as Faraday postulated exists then it must be possible to produce in this medium periodic variations of the electric and magnetic fields having the characteristics of waves. He then compared the velocity of light and the velocity of some electromagnetic disturbance and the more accurately the velocity of light was measured, the more closely did it agree with the velocity of propagation of the electromagnetic waves predicted by Maxwell. It was Hertz in 1887, who first discovered a means of detecting the waves, and today these waves are as familiar to us as the light waves, for

they are the waves used in radio transmission. To Newton and Huygens radiation was light, that which affected the eye and produced the sensation of sight. But it was not long before it was discovered that this band of color called the visible spectrum was only a small part of the electro magnetic spectrum. A thermo pile placed in the dark beyond the red registered heat, and a photographic plate beyond the violet was affected even more strongly than by the visible spectrum. Then the great romance of the century began when men filled in all the gaps of the spectrum. The visible part was very small compared with the heat and Hertizian or radio waves as compared to the ultra violet x rays, gama rays and the new cosmic rays of Millikan.

On the chart were arranged the waves in octaves. As in sound, an octave is the interval between two frequencies that has a radio of 2. Our ears have a range of about eleven octaves from 16-32-64-128-256 etc to 32,678 vibrations a sec. Instead of the frequencies on the chart we have taken the wave lengths as V=nL and L=v/n. But v is constant so L varies inversely as V. The longest radio waves are about 30,000 meters, so taking as an arbitrary starting point, 25,000 the next octave is ½ of this or 12,800 meters. For simplicity call it 10,000 meters or 10^6cm. We know that the velocity of the electromagnetic waves is $3x10^{10}$ cm per sec. and from the equation that the frequency is $3x10^4$ or 30 kilocycles. And so as the wave length becomes smaller the frequency becomes greater, for as we move from $3x10^7$ mm to 3x10-9 the frequency changes from 104 to 1020 vib. per. sec.

This reasoning caused a shift of attention from the properties of the medium—the ether—to the properties of matter. The reasoning is simple. The Hertzian waves originate when electric charges are in oscillation. Light waves, and x rays and gama rays as well as heat waves are of the same nature. But the frequencies are so great in the short wave lengths it is natural to suppose that the atoms contain vibrating charges or electrons. This idea that the atom contains electric charges has been amply confirmed from other branches of Physics. The habit of looking for the source of waves in a vibrating body is firmly ingrained in our minds, so its only natural to look for the source of the electromagnetic waves in the vibrating charges. And the so-called New Physics of today is studying the structure of the atom from the radiations it emits or absorbs. In fact there can be no advance in the study of matter without a corresponding advance in that study of the electromagnetic spectrum.

The Stethophone.

A few years ago Messrs. H. A Frederick and H. F. Dodge published in the Bell System Technical Journal an article dealing with a then new invention—The Stethophone. This invention was described in a

paper under the above title. It is in effect an electrical stethoscope. Not only has it enlarged the field of the ordinary stethoscope, by rendering audible, hitherto inaudible sounds, a wonderful accomplishment in itself, but it has reproduced those sounds and amplified them to such an extent that a whole clinic may listen simultaneously to what was previously an almost unexplored field. The selectivity of sounds of certain frequencies is made possible by means of electric filters and the amplification of these sounds is brought about much after the fashion of the amplification in radio. The Stethophone has also made it possible to record peculiar and rare heart and body sounds in a permanent form by means of phonographic records. T. J. LOVE, S. J.

The Attack on the Problem of the Earth's Age.

This paper reviewed summarily the literature on the age of the earth. It indicated the older figures of the Caldean priesthood, the Babylonian astrologers, Lucretius, Zoroaster and those who felt that they were obligated to figures in accord with the literal interpretation of the Scriptural narrative. It was pointed out that the first attack on the problem by professional geologists dates back about a century. From the very outstart these scientists frowned on any figures which did not read high in the millions. The methods employed by geologists were many. Only those methods were reviewed which have carried favor. The first of these is the determination from the eccentricity of the orbit of Mercury. On this basis Jeffreys has calculated the age of this planet and, by inference, of the earth to be in the order of 2500 millions of years. Realizing that these figures lack exactness, this same physicist has averaged the age between the limits of 1000 and 5000 millions of years. The second method brought under discussion was the determination from the origin and history of the moon. On this basis a *few* thousand years is set as the earth's age. The geological methods, or perhaps better-called, the denudational methods, give as the closest estimate for the age of the ocean 3.5×10^8 years. These very low figures are construed as proof that the rate of denudation in the past was far less than that of the present time. The most accredited method today was founded in the researches on radium. It was found, following the earlier researches of Bequerel and Curie, that the rate of formation of the emanations was measured to be such that if originally one gram of radium was present this was reduced to one half gram in 1500 years. The invariable association of R with U in consequence of which as fast as R breaks up new R is formed by the break up of the U itself would seem to account why uniniferous ores, thousands of years old, showed the presence of R. When the genesis of the unstable derived elements have come to an end, a stable inert end-product is found, chemically identical with lead. In

this was seen the possibility of an accurate geological time piece. Computations have shown that a million grams of U give rise to 1/7400 grams of uranium lead. This yearly. With the percentage of U in a mineral analysis known and that of uranium lead, accumulated therein, the time problem is easy. But the analytical methods of separation are far from mastered. This because the amounts of significant elements are so small that minute analytical errors have proportunately greater effect upon the ultimate result. These errors are in the order of hundreds of thousand of years. The sources of the errors are:

(a) The analysis, however accurately conducted, in the order of a mineral analysis, cannot show that all of the lead separated is of radio-active origin, or whether this came from uranium or from thorium, usually present in the uranium ores, and itself radio-active, or from other sources.

(b) The enrichment by lead from some non-radio-active source is not eliminated and also the removal (partial) of the lead radio-actively produced.

(c) The fact that there is no actual measurement of that proportion of the total lead which is known to have been produced from the uranium alone.

(d) The existence of possible isotopes of uranium which have disintegrated more rapidly in the past than the uranium with which experiments are conducted today.

There followed a discussion of more recent attempts to assay the lead more accurately. This is done with a mass-spectrograph. It was pointed out that today that the more reliable figures for the age of the earth as indicated by geologists read to the two limits of 1.3×10^9 to 8×10^9 years.

REV. F. TONDORF, S. J.

Newspaper Astronomy.

Thomas D. Barry, S. J.

(Abstract)

While admitting that the greater part of the news articles dealing with scientific subjects, especially astronomy, are both accurate and interesting without being too sensational, the paper found that much remained to be desired in this matter. Articles that could be objected to were divided into two classes:—

1) Those that aimed to give clear accounts of scientific events, but which contained inaccurate and misleading statements.

2) Those that dealt in a sensational manner with fantastic subjects.

In order to avoid the confusion often resulting from two or more observers making simultaneous or nearly simultaneous records on the chronograph, a device suggested by Father Phillips, S.J., about a year ago, was tried out and a determination of its accuracy was made.

Examples were given of each type.

Simultaneous Records of the Chronograph.

John S. Blatchford, S. J.

(Abstract)

This device consisted of a door-bell or buzzer of low frequency connected in parallel across one of the observers keys. The observer who used this key produced a vibrating line on the chronograph while another observer without this attachment produced the usual straight signal. This made the two signals easily distinguishable. If both keys were pressed together the beginning of each signal could be identified and measured provided the vibrating key were pressed first. If not only one signal could be measured. Both could be identified however, if the vibrating one were depressed slightly longer than the other.

The lag of this method as determined by two sets of observations had a mean value of 0.016 seconds.

CONSTITUTION

OF THE

AMERICAN ASSOCIATION OF JESUIT SCIENTISTS

(Eastern States Division)

ARTICLE ONE

NAME

The name of this Association shall be "*American Association of Jesuit Scientists*," with the sub-title "Eastern States Division."

ARTICLE TWO

AIM

The aim of the Association is to promote the teaching of Science and Mathematics in our schools and colleges by mutual encouragement and stimulation, the presentation, discussion, and publication of papers.

ARTICLE THREE

MEMBERSHIP

1. Teachers of Biology, Chemistry, Mathematics, and Physics as a major branch in Jesuit Institutions, who are at the same time willing to co-operate in the work of the Association are eligible for membership. This condition shall apply to other sections of the Association that may be formed in the future. The co-operation referred to is the willingness to present a paper at the annual convention from time to time.

2. Former teachers of such major branches, and now engaged in the studies of the Society, as well as students of Science who intend to devote themselves to teaching one or the other of these branches are also eligible for membership.

3. Applications for membership will be accepted and passed upon by the Executive Council specified in Article Four.

4. There shall be no admission fee for membership. Necessary expenses of the Association shall be defrayed as set forth in Article Eight.

5. The privilege of attending the meetings of the Association is extended to non-members interested in these branches.

ARTICLE FOUR

OFFICERS

1. The officers shall consist of a President, a Secretary-Treasurer, and a Representative from each section. This Representative shall be the presiding officer of his section, and ipso facto, a Vice-President of the Association. These shall constitute an Executive Council for the government of the Association.

2. The President and Secretary-Treasurer shall be elected by the Association. The Representatives shall be elected by the respective sections.

3. The officers shall hold office for one year, or from the end of one convention to the end of the next.

4. The election of officers shall take place at the end of each annual meeting.

ARTICLE FIVE

DUTIES OF OFFICERS

A.—Officers of the Association:—

1. Duties of the President:
   - (a) He shall preside at the general meetings;
   - (b) he shall give a Presidential Address;
   - (c) he shall call and preside at the meetings of the Executive Council.

2. Duties of the Vice-Presidents:
   - (a) They shall represent their respective sections in the meetings of the Executive Council.
   - (b) In the absence of the President, that Vice-President chosen by a majority vote of the Executive Council shall preside.

3. Duties of the Secretary-Treasurer:
   - (a) He shall act as secretary of the Executive Council;
   - (b) he shall keep a record of the membership and of all the transactions of the Association;
   - (c) he shall be the editor of the Proceedings of the Association.

B.—Officers of the sections:—

1. Duties of the Vice-President:
   - (a) He shall preside at all meetings of his own section;
   - (b) he shall deliver a Vice-Presidential address;
   - (c) his other duties are defined above under A-2.

2. Duties of the Secretary:

(a) He shall keep a record of the membership and all the transactions of his section;

(b) he shall arrange the program of his section in conjunction with the Vice-President;

(c) he shall submit a report of the activities of his section at the annual meeting.

ARTICLE SIX

DUTIES OF THE EXECUTIVE COUNCIL

1. It shall define the general policy of the Association.
2. It shall arrange the general program of the annual meeting.
3. It shall make appointments to the Board of Editors as hereinafter specified.
4. It shall meet at least once a year at the call of the President.

ARTICLE SEVEN

SECTIONS

1. The sections of the Association shall be: Biology, Chemistry, Mathematics, and Physics, and such others as may be formed later.

2. Each section shall elect its own presiding officer who shall be a Vice-President of the Association. The Vice-President is to be the Representative of his section on the Executive Council. Each section shall also elect a secretary.

ARTICLE EIGHT

MEETINGS

1. There shall be an annual meeting of the Association and its sections at a time and place specified by the Executive Council.

ARTICLE NINE

PROCEEDINGS

1. The proceedings of the general meeting shall consist of scientific papers of universal interest.

2. The proceedings of the sectional meetings shall consist of papers and discussions on scientific and mathematical topics. Methods of presentation and demonstration, results of research work, developments in the art of teaching, historical investigations, etc., will be proper matter for discussion at these meetings.

3. The proceedings of the Association shall be printed and published annually under the direction of the Executive Council.

ARTICLE TEN

PUBLICATIONS

1. In accordance with Article II, section 1, besides the Proceedings, a periodical bulletin shall be issued containing news of interest to the Association and articles on scientific topics by the members.

2. This bulletin shall be under the direction of an Editor-in-chief to be appointed by the Executive Council.

3. The board of editors shall consist of the chief editor and an associate editor from each section. This board shall be appointed by the Executive Council and shall hold office until changed by the Council.

ARTICLE ELEVEN

FUNDS

1. In accordance with the provisions of Article III, section 4, no admission fees are required.

2. Necessary expenses shall be defrayed by a pro rata assessment upon the members.

ARTICLE TWELVE

ALTERATION OF THE CONSTITUTION

1. This constitution may be amended by a majority vote of the members present, subject to such restrictions as arise from the special nature of this Association.

MEMBERSHIP OF ASSOCIATION
1928-1929

GENERAL OFFICERS

President

Rev. Richard B. Schmitt, Loyola College, Baltimore, Md.

Secretary-Treasurer

Lawrence C. Gorman, Georgetown University, Washington, D. C.

Executive Council

Very Rev. Edward C. Phillips, 501 East Fordham Road, New York City.

Rev. Richard B. Schmitt, Loyola College, Baltimore, Md.

Rev. John A. Frisch, Georgetown University, Washington, D. C.

Rev. William G. Logue, Woodstock College, Woodstock, Md.

Lawrence C. Gorman, Georgetown University, Washington, D. C.

Editors of Bulletin

Rev. John L. Gipprich, Georgetown University, Editor-in Chief.

Secretaries of Various Sections, Sub-Editors.

Editor of Proceedings

Lawrence C. Gorman, Georgetown University, Washington, D. C.

MEMBERS AND SECTION OFFICERS
1928 - 1929

Note: The figures at the end of each entry indicate the year in which member was admitted to the Association.

HONORY MEMBER

Mr. George C. Jenkins, 1924, Baltimore, Md.

BIOLOGY SECTION

Officers (1928 - 1929)

Chairman, Rev. John A. Frisch, Georgetown University, Washington, D. C.

Secretary and Sub-Editor of the Bulletin, Charles A. Berger, Loyola College, Baltimore, Md.

Members

Avery, Rev. Henry C. 1923. Ateneo de Manila, Manila P. I.

Berger, Charles A., 1926. Loyola College, Baltimore, Md.

Busam, Rev. Joseph S., 1922. St. Andrew-on-Hudson, Poughkeepsie, N. Y.

Coniff, Arthur A., 1928. Gonzaga High School, Washington, D. C.

Didusch, Rev. Joseph S., 1922. Woodstock College, Woodstock, Md.
Dore, Rev. Francis J., 1922. Boston College, Boston, Mass.
Dubois, Evan C., 1924. Weston College, Weston, Mass.
Freatman, Harold L., 1924. Woodstock College, Woodstock, Md.
Frisch, Rev. John A., 1924. Georgetown University, Washinton, D. C
Harley, James L., 1927. St. Joseph's College, Philadelphia, Pa.
Hugal, Francis A., 1926. Boston High School, Boston, Mass.
Kirchgessner, George J., 1925. Fordham University, New York City.
MacCormack, A. J., 1925. Weston College, Weston, Mass.
McCauley, Rev. David V., 1923. Canisius College, Buffalo, New York.
Pollock, Rev. John A., 1923. St. Andrew-on-Hudson, Poughkeepsie, N. Y.
Reardon, Rev. Francis X., 1925. Woodstock College, Woodstock, Md.
Shaffrey, Rev. Clarence E., 1923. St. Joseph's College, Philadelphia, Pa.
Tondorf, Rev. Francis A., 1923. Georgetown University Washington, D. C.

CHEMISTRY SECTION

Officers (1928 - 1929)

Chairman, Rev. Richard B. Schmitt, Loyola College, Baltimore, Md.
Secretary and Sub-Editor of the Bulletin, Lawrence C. Gorman, Georgetown University, Washington, D. C.

Members

Ahern, Rev. Michael J., 1922. Weston College, Weston, Mass.
Bihler, Rev. Hugh J., 1925 Woodstock College, Woodstock Md.
Blatchford, John A., 1923. Weston College, Weston, Mass.
Brosnan, Rev. John A., 1923. Woodstock College, Woodstock, Md.
Brown, Rev. Joseph T., 1922. St. Joseph's College, Philadelphia, Pa.
Butler, Rev. T. Joseph, 1922. Woodstock College, Woodstock, Md.
Coyle, Rev. George L., 1922. Georgetown University, Washington D. C.
Gisel, Eugene A., 1925. Woodstock College, Woodstock, Md.
Gookin, Vincent A., 1923. Weston College, Weston, Mass.
Gorman, Lawrence C., 1926. Georgetown University, Washington, D. C.
Hohman, Rev. Arthur J., 1922 Boston College, Boston, Mass.
Langguth, Rev. Aloyisius B., 1924. Holy Cross College, Worcester, Mass.
MacLeod, Henry C., 1924. Weston College, Weston, Mass.
Martin, Rev. Richard, 1923. Fordham University, New York City.
McCullough, Rev. Henry B., 1923. St. Andrew-on-Hudson, Poughkeepsie, N. Y.
McLoughlin, Rev. Henry W., 1922. 890 Park Ave., New York City.
Muenzen, Rev. Joseph B., 1923. Tertianship.
Power, Francis W., 1924. Weston College, Weston, Mass.

Schmitt, Rev. Richard B., 1923. Loyola College, Baltimore, Md.
Sohon, Rev. Frederick W., 1923.
Strohaver, Rev. George F., 1922. Holy Cross College, Worcester, Mass.
Sullivan, Rev. Joseph J., 1923. St. Andrew-on-Hudson, Poughkeepsie. N. Y.
Tivnan, Rev. Edward P., 1923. Weston College, Weston, Mass.
Whelan, James F., 1926. Woodstock College, Woodstock, Md.
Wolff, Edmund J., 1926. Woodstock College, Woodstock, Md.

MATHEMATICS SECTION

Officers (1928 - 1929)

Chairman, Very Rev. Edward S. Phillips, 501 East Fordham Road. New York City.
Secretary and Sub-Editor of the Bulletin, Thomas D. Barry, Weston College, Weston, Mass.

Members

Archer, Rev. Peter, 1922. Canisius College, Buffalo, New York
Barry, Thomas D., 1926. Weston College, Weston, Mass.
Berry, Rev. Edward B., 1922. Woodstock College, Woodstock, Md.
Bouwhuis, Rev. Andrew L., 1923. Woodstock College, Woodstock, Md.
Brock, Rev. Henry M., 1922. Weston College, Weston, Mass.
Carasig, Rev. Paul M.. 1923. San Jose Observatory, Manila, P. I.
Codaire, George A., 1924. Weston College, Weston, Mass.
Crawford, Rev. William R., 1924. Boston College, Boston, Mass.
Cusick, William H., 1928. Boston High School, Boston, Mass.
Dawson, Rev. James F., 1923. Woodstock College, Woodstock, Md.
Depperman, Rev. Charles E., 1923. San Jose Observatory, Manila, ,P. I.
d'Invilliers, Joseph A., 1927. Georgetown Preparatory School, Garrett Park, Md.
Doucette, Bernard F., 1925. Weston College, Weston, Mass.
Fey, Leo F., 1926. Canisius High School, Buffalo, N. Y.
Gipprich, Rev. John L., 1922. Georgetown University, Washington. D. C.
Kelly Rev. Joseph P., 1922. Weston College, Weston, Mass.
Kennedy, William W., 1923. Weston College, Weston, Mass.
Logue, Louis R., 1923. Weston College, Weston, Mass.
Long, John J., 1924. Woodstock College, Woodstock, Md.
McCormack, Rev. James T., 1923. Boston High School, Boston, Mass.
McGarry, Rev. William J.. 1923. Weston College, Weston, Mass.
McLaughlin, Thomas L., 1923. Weston College, Weston, Mass.
McNally, Rev. Paul A., 1923. Georgetown University, Washington, D. C. ,

Murphy, John J., 1922. Weston College, Weston, Mass.
Murray, Joseph L., 1925. Boston College, Boston, Mass.
Nuttall, Edmund J., 1925. Georgetown University, Washington, D. C.
O'Donnell, George A., 1924. Weston College, Weston, Mass.
O'Loughlin, Rev. Francis D., 1923. Fordham University, New York.
O'Mahoney, Timothy J., 1926. Boston College High School, Boston, Mass.
Phillips, Rev. Edward C., 1922. 501 East Fordham Road, New York, N. Y.
Quigley, Thomas H., 1925. Weston College, Weston, Mass.
Roth, Albert C., 1923. Woodstock College, Woodstock, Md.
Roth, Charles A., 1923. Woodstock College, Woodstock, Md.
Setter, Rev. John G., 1928. Woodstock College, Woodstock, Md.
Smith, Rev. John P., 1923. St. Peter's College, Jersey City, N. J.
Sheehan, William D., 1928. Holy Cross College, Worcester, Mass.
Walsh, Rev. Joseph B., 1923.
Wessling, Rev. Henry J., 1923. Boston College High School, Boston, Mass.

PHYSICS SECTION

Officers (1928 - 1929)

Chairman, Rev. William G. Logue, Woodstock College, Woodstock, Md.
Secretary and Sub-Editor of the Bulletin, Joseph R. Hearn, Woodstock College, Woodstock, Md.

Members

Berry, Rev. Edward B., 1922. Woodstock College, Woodstock, Md.
Brock, Rev. Henry M., 1922. Weston College, Weston, Mass.
Codaire, George A., 1924. Weston College, Weston, Mass.
Crawford, Rev. William R., 1924. Boston College, Boston, Mass.
Crowley, John J., 1922. Woodstock College, Woodstock, Md.
Dawson, Rev. James F., 1923. Woodstock College, Woodstock, Md.
Delaney, Rev. John P., 1923. Canisius College, Buffalo, N. Y.
Depperman, Rev. Charles E.,1923. San Jose Observatory, Manilla, P. I.
d'Invilliers, Joseph A., 1927. Georgetown University, Washington, D. C.
Doucette, Bernard F., 1925. Weston College, Weston, Mass.
Fay, Rev. T. Augustine, 1923. Boston College, Boston, Mass.
Fey, Leo F., 1926. Canisius High School, Buffalo, N. Y.
Gipprich, Rev. John L., 1922. Georgetown University, Washington, D. C.
Hearn, Joseph R., 1925. Woodstock College, Woodstock, Md.
Kollmeyer, Rev. E. J., 1922. Tertianship.
Logue, Rev. William G., 1923. Woodstock College, Woodstock, Md.
Long, John J., 1924. Woodstock College, Woodstock, Md.

Love, Rev. Thomas J., 1923. Loyola College, Baltimore, Md.
Lynch. Rev. Daniel J., 1923. Boston College, Boston, Mass.
Lynch, Rev. John J. Fordham University, New York, N. Y.
Mahoney, Rev. Daniel P., 1924. Weston College, Weston, Mass.
Mahoney, Rev. James B., 1925. Ateno de Manila, Manila, P. I.
McAree, Rev. Joseph F., 1923. Tertianship.
McGowan, George P., 1928. Georgetown University, Washington, D. C.
McLaughlin, Thomas L., 1923 Weston College, Weston, Mass.
McNally, Rev. Herbert P., 1922. Woodstock College, Woodstock, Md.
Merrick, Rev. Joseph P., 1923. Holy Cross College, Worcester, Mass.
Miley, Rev. Thomas H., 1923. St. Joseph's College, Philadelphia, Pa.
Moore, Thomas H., 1923. Woodstock College, Woodstock, Md.
Murray, Joseph L., 1928. Boston College. Boston. Mass.
Nuttall, Edmund J., 1928. Woodstock College, Woodstock, Md.
O'Connor, John S., 1928. St. Louis University, St. Louis, Mo.
O'Loughlin, Rev Thomas D., 1923 Fordham University, New York, N. Y.
Phillips, Very Rev. Edward C., 501 Fordham Road, New York, N. Y.
Quigley, Thomas H., 1925. Weston College, Weston, Mass.
Rafferty, Rev. Patrick, 1923. Cagayan, Misamis, Mindanao, P. I.
Roth, Albert C., 1923. Woodstock College, Woodstock, Mass.
Sheehan William D., 1928. Holy Cross College, Worcester, Mass.
Sheridan, Robert E., 1922. Weston College, Weston, Mass.
Smith, Thomas J., Woodstock College, Woodstock, Md.
Sullivan, Rev. Daniel H., 1923. Cagayan, Misamis, Mindanao, P. I.
Tobin, Rev. John A , 1923. St. Andrew-on-Hudson, Poughkeepsie, N. Y.
Tynan, Rev. John W., 1926. Fordham University. New York, N. Y.